# NEW ADDITIONS TO THE INVENTORY OF COLORADO MAYFLIES (EPHEMEROPTERA)[1]

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ABSTRACT: Four mayfly species, *Baetis dardanus, Paracloeodes minutus, Homoeoneuria alleni*, and *Rhithrogena pellucida* are reported from Colorado for the first time. *Homoeoneuria* and *Paracloeodes* represent new generic records for the state. The male terminalia of *R. pellucida* from Colorado and a paratype from Minnesota are illustrated and compared, and characters are given to separate this species from the four other *Rhithrogena* species in Colorado. Previous tentative records for two additional species, *Baetis virile*, and *Leptophlebia nebulosa* are confirmed. Biogeographic affinities for several species in the North Platte River system are discussed. A total of 43 genera and 101 species of mayflies are now known from Colorado.

McCafferty *et al.* (1993) listed 41 genera and 97 species of Colorado mayflies. In this paper we report four new species records for the state. The first of these, *Baetis dardanus* McDunnough, was collected from the Green River in Dinosaur National Monument. This species belongs to the *Baetis propinquus* group, and the larvae will key to *Baetis ephippiatus* Traver in Morihara and McCafferty (1979a). However, the larvae of these two closely related species can be separated using the characters given by Soluk (1981). In that paper he described two principal types of dorsal abdominal patterns, and our specimens correspond to the one that is figured. Morihara and McCafferty (1979b) provided a key to separate adult males of the *Baetis propinquus* group. Previously, *B. dardanus* had been reported from Alberta, Manitoba, Idaho, Utah, and Illinois (Soluk 1981), and McCafferty *et al.* (1993) predicted that this species might eventually be found in Colorado.

The second state record, *Homoeoneuria alleni* Pescador and Peters, was discovered in the Yampa River in Dinosaur National Monument. Larvae were collected approximately 0.2 km upstream of the Yampa-Green River confluence in larval fish drift nets that were used during a study on the reproduction and larval abundance of the federally listed endangered Colorado squawfish. Previous distributional records for *H. alleni* include New Mexico, Utah, and Chihuahua, Mexico (Pescador and Peters 1980). This species had been mentioned by McCafferty *et al.* (1993) as possibly occurring in Colorado, therefore, its discovery in the state was expected. The adults of *H. alleni* remain unknown.

The third new record from Colorado, *Paracloeodes minutus* (Daggy), was discovered in a benthic sample taken from the Conejos River near LaSauses. This locality provides the habitat that *P. minutus* seems to prefer (Edmunds *et*

[1] Received February 1, 1994. Accepted March 10, 1994.

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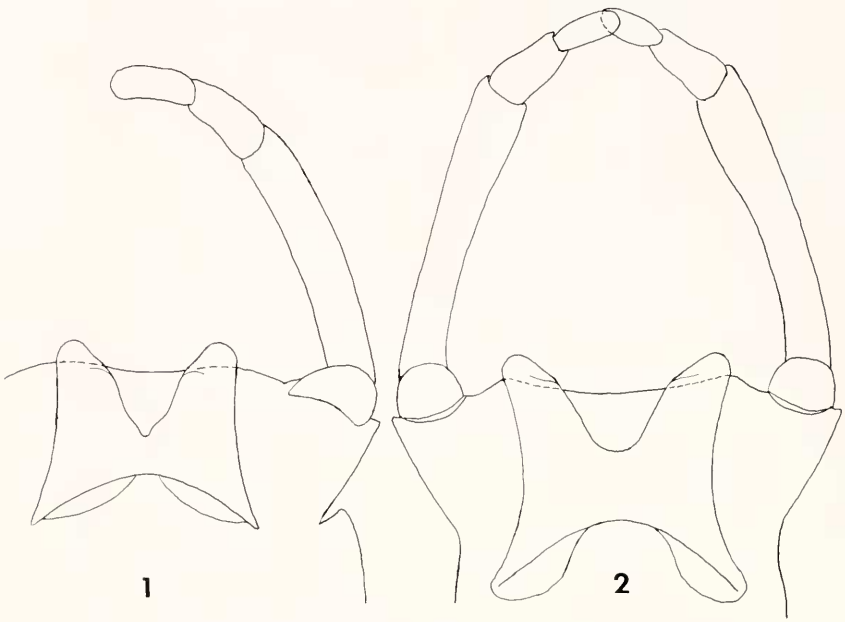
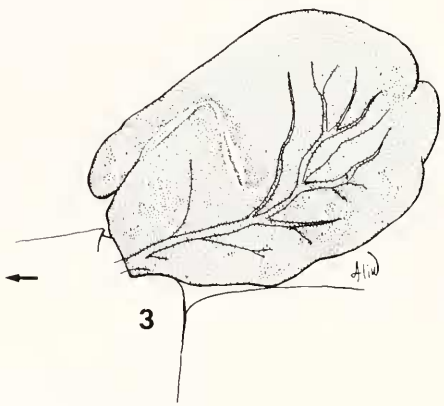
*al.* 1976). These three-tailed larvae are easily overlooked in benthic samples due to their small size and pale color (Day 1955), and workers need to be careful not to mistake this species for small *Baetis* spp. The distinctive labial palps and the relatively long tarsal claws as illustrated by Edmunds *et al.* (1976) distinguish this genus. *Paracloeodes minutus* is known from Minnesota (Daggy 1945), California (Day 1955, as *P. abditus*, [see McCafferty and Waltz 1990]), Indiana (McCafferty and Waltz 1990), and Illinois and Texas (McCafferty and Davis 1992).

The fourth new species record for the state, *Rhithrogena pellucida* Daggy, was collected from the North Platte River near Walden, Colorado. It was previously suggested that *Rhithrogena* larvae collected here during 1991 and 1992 might be the unknown larvae of *R. flavianula* (McDunnough) (see McCafferty *et al.* 1993). However, in August of 1993, *Rhithrogena* adults collected and reared from this site were determined to be *R. pellucida*. The original description of this species by Daggy (1945), and the redescriptions by Burks (1953), and Leonard and Leonard (1962) adequately match our specimens from Colorado. For comparison purposes we provide illustrations of the male terminalia using a specimen from Colorado (Fig. 1 ) and a paratype from the original type series (Mississippi River, Minneapolis, Minnesota, 1 July 1939) (Fig. 2). Some differences were noted, particularly in the relative shape of the median notch of the penes. Also, the penes of the Colorado specimens differ slightly from typical midwestern specimens by having a larger dorsal subapical membranous excavation. However, similar variability has been found between populations throughout the Midwest (W. P. McCafferty, pers. comm.). The adults of *R. pellucida* can easily be separated from the other four species of *Rhithrogena* in Colorado by their distinctive genitalia (Fig. 1) and small size. The larvae of *R. pellucida* can be separated from the other species of Colorado *Rhithrogena* by the absence of a dorsal lobe on gills 2-6 (present on *R. hageni* Eaton, and *R. undulata* [Banks]), and the absence of a longitudinal ventral sclerotized setose line on gills 2-6 (present on *Rhithrogena robusta* Dodds) (Jensen 1966). In addition, the larvae of *R. pellucida* have a characteristic V-shaped transparent marking on the ventral gill surface that points out perpendicular to the long axis of the body (Fig. 3). Although the larvae of *R. flavianula* are unknown, the much larger size of the adults (body length 14mm) (McDunnough 1924), should make mature larvae of this species easily separable from the much smaller *R. pellucida* (body length 6-7mm). *Rhithrogena pellucida* has been recorded from Minnesota (Daggy 1945), Michigan (Daggy 1945, Leonard and Leonard 1962), Illinois (Burks 1953), Wisconsin, (Flowers and Hilsenhoff 1975, 1978), Virginia (Kondratieff and Voshell 1983), Alabama (Kondratieff and Harris 1986), Indiana (McShaffrey and McCafferty 1988), and Maine (Burian and Gibbs 1991).

Two additional species, *Baetis virile* (McDunnough), and *Leptophlebia*




Figs. 1 and 2. *Rhithrogena pellucida,* male terminalia, dorsal view. 1. North Platte River, Jackson County, Colorado, 19 August 1993. 2. Paratype, Mississippi River, Minneapolis, Minnesota, 1 July 1939.

Fig. 3. *Rhithrogena pellucida*, larval abdominal gill 5, ventral view, North Platte River, Jackson County, Colorado, 19 August 1993. Anterior end indicated by arrow.

*nebulosa* (Walker), tentatively listed as occurring in Colorado by McCafferty *et al.* (1993), have been confirmed for the state. *B. virile* was reared from the North Platte River near Walden, and from Tomichi Creek near Gunnison. We compared these reared specimens with the descriptions by McDunnough (1923) and Traver (1935) and have determined them to be *B. virile*. The previous record from Colorado was based on a single larva taken from Grizzly Creek, a tributary of the North Platte River (McCafferty *et al.* 1993). We have also confirmed *L. nebulosa* from Colorado by rearing a large series of adults from the South Fork of the Republican River in Yuma County in eastern Colorado. This species has been recorded from much of eastern and midwestern North America, so its occurrence in the Great Plains of Colorado is not surprising.

In addition to *R. pellucida*, three other mayflies with primarily eastern/midwestern North American distributions, *Heterocloeon frivolum* (McDunnough), *Barbaetis cestus* (Provonsha and McCafferty), and *Baetis virile* (McDunnough) occur in the North Platte River in Colorado (McCafferty *et al.* 1993). Other aquatic insect species that are considered typical eastern/midwestern North American species and found in this river, include the stonefly *Taeniopteryx parvula* Banks (Kondratieff and Baumann 1988) and the caddisfly *Pycnopsyche guttifer* (Walker) (Ruiter and Lavigne 1985, and Ruiter 1990).

The North Platte River originates as snowmelt streams in the mountains of northern Colorado, flowing northward into central Wyoming, then southeastward into Nebraska. In west-central Nebraska, the river joins the South Platte River to form the Platte River, a major tributary of the Missouri River. The North Platte River flows into the Wyoming Basin, a plateau, which interrupts the continuity of the Rocky Mountain system. Here the North Platte River cuts through two mountain ranges, the Seminoe and the end of the Laramie Mountains before reaching the Great Plains. Most of this region was not glaciated during the last ice age except for high mountain glaciers. The upper North Platte River may have served as effective refugia or population pools for the above species. The Platte River system has been extensively altered by at least 194 reservoirs of capacities greater that 0.6 $hm^3$ and hundreds of agricultural diversion canals (Kirchner and Karlinger 1983). Therefore, intervening populations of these mayfly, stonefly, and caddisfly species along the North Platte in Wyoming or Nebraska may have been reduced to small local populations or have become extinct.

Material examined. - *B. dardanus:* Moffat Co., CO, Green River, 19 August 93, B. Kondratieff and R. Durfee, 15 larvae, (four slide mounts). *H. alleni*: Moffat Co., CO, Yampa River, 24 July 92, R. T. Muth, 15 larvae. *P. minutus:* Conejos Co., CO, Conejos River, 27 July 92, Colorado Department of Health, 1 larva (slide mount). *R. pellucida:* Jackson Co., CO, North Platte River, 19 August 93, B. Kondratieff and R. Durfee, 3 males, 3 larvae, and 2 males and 1 female (reared).

*B. virile* Jackson Co., CO, North Platte River, 19 August 93, B. Kondratieff and R. Durfee, 2 females (reared); Gunnison Co., CO, Tomichi Cr., 4 September 93, B. Kondratieff and R. Durfee, 8 males, 10 females (reared), and 8 larvae. *L. nebulosa*: Yuma Co., CO, South Fork Republican River, 25 April 93, B. Kondratieff and R. Durfee, 17 males, 7 females (reared).

## ACKNOWLEDGMENTS

We thank Robert T. Muth, Department of Fishery and Wildlife, Colorado State University for providing the larval fish samples from the Yampa River, which contained *H. alleni*. Jim Harvey, Colorado Department of Health provided the benthic samples from the Conejos River. Philip J. Clausen, University of Minnesota is thanked for the loan of specimens from the original type series of *R. pellucida*.

We thank Howard E. Evans, Tom Eckberg, Colorado State University and R. Fred Kirchner, U. S. Army Corps of Engineers for providing reviews of the manuscript. W. P. McCafferty, Purdue University is thanked for information on the variability of *R. pellucida*.

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## EDITORIAL NOTE

In the following pages of this issue, *Entomological News* presents two papers on the introduction and establishment of non-indigenous species of Coccinellidae (Coleoptera). These papers present some conflicting data and one expresses some controversial and possibly speculative views on the establishment of 'adventive' vs. (purposely) 'introduced' species. *Entomological News* neither supports nor takes issue with either position but leaves consideration of the presented positions to its readers.

H.P.B